

Umbilical Coiling Index: An Important Predictor of Fetal Outcome

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ABSTRACT

Umbilical cord is an important structure for fetal survival. Any abnormality of the umbilical cord can lead to fetal distress, growth restriction and intrauterine death. A rare case of long cord with high umbilical coiling index leading to growth retardation and fetal distress is reported and importance of umbilical coiling index is discussed.

Keywords: Umbilical cord, Fetal distress, nonstress test.

INTRODUCTION

Umbilical cord represents the only connection between the mother and the fetus that determines not only fetal welfare but also its existence. Umbilical cord lies freely in the amniotic fluid making it vulnerable to kinking, torsion, entanglement and compression. The fetal distress which is a common entity during labor monitoring usually occurs due to umbilical cord compression and cord around neck. A very rare case of excessive long umbilical cord with high umbilical coiling index causing fetal distress is reported.

CASE REPORT

A 26 year second gravida with parity one and no live issue at 34 weeks gestation from last menstrual period presented with decreased movements since night. There was no history headache, pain in abdomen, blurring of vision, vaginal leaking or bleeding. She was on regular antenatal checkup. She had preterm vaginal delivery of dead fetus at 35 weeks of gestation one year back. No details were available regarding that pregnancy.

Her general physical and systemic examination was unremarkable. Her pulse rate was 80/minute and blood pressure was 112/70 mm of Hg. Abdominal examination revealed 30–32 weeks size relaxed uterus,

adequate liquor and with fetus in breech presentation. On auscultation, fetal heart rate was 90/minute initially but picked to 120/min immediately. Her hemoglobin was 11 gm%. Her ultrasound showed single live fetus of approximately 31 weeks gestation and intrauterine growth retardation of 3 weeks with central placenta praevia. Biophysical profile was 8/8 and fetal weight was 1.6 kg. Doppler studies revealed S/D ratio of 3.7 in umbilical artery and 4.4 in middle cerebral artery. Her nonstress test on cardiotocograph showed decreased beat to beat fetal heart rate variability (**Fig. 1**) with prolonged variable deceleration (**Fig. 2**). Immediate cesarean section was performed in view of previous history of preterm intrauterine death at 35 weeks gestation, decreased fetal movements, and repeated prolonged variable deceleration with decreased fetal heart rate variability. Baby was distressed with apgar score 2, 4 and 5 at 1, 5 and 10 minutes and needed artificial ventilation. Baby's weight was 1800 grams and placental weight was 450 gm. The umbilical cord was excessive long (170 cm) with left sided hypercoiling (**Fig. 3**). There were 74 coils with umbilical cord coiling index of 0.44 coils/cm. Histopathological examination of cord and placenta showed increased syncytial knots, intervillous hemorrhage, intraluminal thrombus formation with thickening of trophoblastic layer.

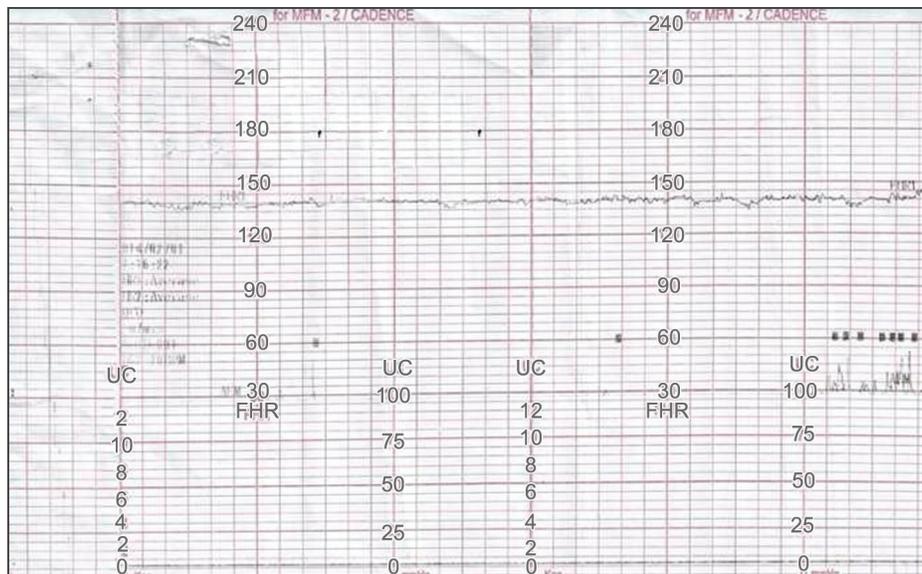


Fig. 1 Nonstress test showing decreased beat to beat fetal heart rate variability

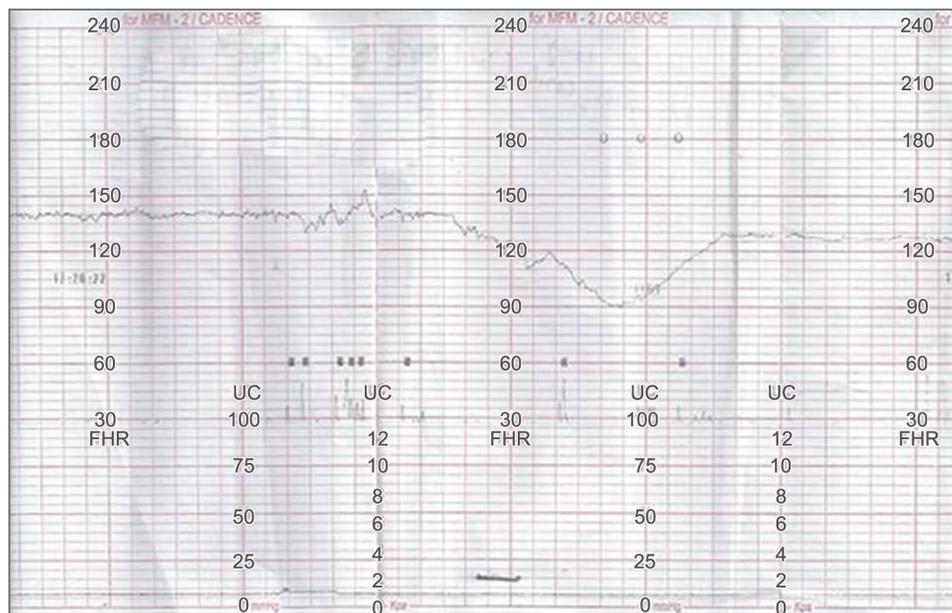


Fig. 2 Nonstress test showing prolonged variable deceleration with fetal heart rate dipping to 90/minute

DISCUSSION

The umbilical cord is vital for the development of the fetus. The normal umbilical cord length varies from 30–100 cm with having a length of 45–50 cm in most of the cases. In our case, the length of cord was 170 cm which is very rare to find. Although cases with very long cord have been reported,^{1,2} but we could not find case of excessive long cord with very high coiling index as in this case on literature search. Taweevisit M has reported

umbilical cord length of 130 cm associated with fetal thrombotic vasculopathy and fetal demise at 37 weeks of gestation.² Thrombosis related complications are very commonly observed in long umbilical cord and cord around necks.³

The coils are the normal features of the cord that are formed due to the fetal movement, torsion of the embryo (active or passive), differential growth of umbilical vessels, hemodynamic forces of fetus or due



Fig. 3 Peroperative picture of hypercoiled long cord and inset showing normal cord

to presence of Roach muscle.⁴ It has been observed that only pressure gradient between the umbilical vein and the fetal inferior vena cava is not sufficient to transport the necessary amount of blood to the fetus. Therefore, the other theory has been postulated for the blood flow towards the foetus which was supported by the presence of coils in the umbilical cord. The arteries in the umbilical cord stretch in length during pulsations, leading to relative negative pressure in the umbilical vein causing forward venous blood flow. Umbilical cord also becomes more flexible and strong due to the presence of coils. Coils also provide resistance to external forces which could compromise blood flow. The normal range of coils varies from 0 to 40. The umbilical cord coiling index is the ratio of coils to the length of the cord. The normal UCI is $0.17 \pm .009$ coils/cm.⁵ The 10th and 90th centiles are 0.07 and 0.30 coils/cm but in this case it was much higher (0.44 coils/cm). The coiling orientation in the present case is of left side which is the most common type.⁶

Hypercoiling as well as hypocoiling, both are associated with poor fetal outcome. In presence of hypercoiling, the blood flow will be less straight and

more blood will come in contact with the vessel-wall leading to more turbulence and further stasis down the blood flow. Thus hypercoiling is associated with fetal growth retardation, intrauterine death, preterm delivery, intrapartum fetal heart rate decelerations, operative delivery for fetal distress, meconium staining which occurred in our case. In a study of fetal growth restriction with hypercoiling, it has been found that these fetuses are at high risk of hypoxia due to fetal venous system alteration.⁷ Few authors have given the hypothesis that the hypo as well as hypercoiled cords are less flexible, making them more prone for kinking and torsion during labor.^{8,9} Prenatal sonographic assessment of umbilical cord coiling index during 2nd trimester scan of congenital anomaly can predict small for gestational age babies and nonreassuring pattern on cardiotocogram during labor.¹⁰

CONCLUSION

The length and the umbilical cord coiling index must be assessed in the second trimester ultrasonographic examination more so in cases of intrauterine growth restriction and previous history of unexplained intrauterine death. Prolonged variable deceleration and the decreased beat to beat heart rate variability are a sign of fetal distress requiring intervention.

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